R E M A R K S

Claims 1-23 are pending in this application. Claims 21-23 have been added. All claims are under examination. The application contains two independent claims, namely claims 1 and 22. All other claims are dependent claims. All dependent claims are either directly or indirectly dependent upon claim 1.

SUPPORT

Both independent claims have been amended to require a specific monomer content. Support for this amendment can be found in the application as filed on page 17 at lines 13-16.

ISSUES UNDER 35 USC 112

The rejection of claims 11 and 14 in paragraphs 2 and 3 of the last Office Action is traversed, but is rendered moot by the present amendment. Both claims have been amended to recite "number average molecular weight".

ISSUES UNDER 35 USC 102

The rejection of selected claims as lacking novelty under 35 U.S.C. 102 over U.S. Patent 6,117,921 (Ma) is traversed, but is rendered moot by the present amendment. However, Ma does not disclose a graft copolymer having an acrylic polymer side chain

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containing not less than 60 % weight of the monomer represented by the formula (1).

Indeed, the Ma graft copolymer, such as 2-phenoxyethyl-acrylate-co-methyl-methacylate-g-ethoxytriethyleneglycol-methacrylate-co-methacrylic acid referred to by the Examiner, does <u>not</u> possess an acrylic polymer side chain containing not less than 60 % by weight of the monomer represented by the formula (1), <u>but</u> rather a side chain of "ethoxytriethyleneglycol methacrylate-co-methacrylic acid."

Therefore, the claimed subject matter, including the side chain of the graft copolymer is quite different from that of Ma.

The Examiner may not fully appreciate the meaning of the compound "A-graft-B". This compound means that the compound has a side chain of B. In order to prove this fact, a copy of "Polymer Nomenclature" issued by McGraw-Hill on September 20, 1993 is attached hereto as Exhibit B. As is clear from the description at page 155, lines 5 to 10 of this Japanese-language document, (Exhibit B, page 3, paragraph 6.1) the compound "A-graft-B" is intended to mean that this polymer has a side chain of B. A futile search has been made for an English-language translation of Exhibit B without success. It is, however, respectfully submitted that such a definition of a graft copolymer is conventional and is not disputed by the Examiner.

The attention of the Examiner is invited to a completely consistent publication attached as Exhibit C.

In view of the present amendments to claim 1 as to monomer content and in view of the fact, that the only other independent claim, claim 22, is also limited to same monomer content, Ma does not disclose this monomer content and therefore does not anticipate either independent claim 1 or independent claim 22. Since all other claims are dependent upon claim 1, these claims are similarly patentable.

The rejection of selected claims in paragraph 6 of the current Office Action under 35 U.S.C. 102 over U.S. Patent 6,005,023 (Anton) is traversed.

Anton is directed to an ink containing an aqueous carrier. The last Office action refers to a 2002 Office Action, issued on May 10 of that year, which in turn refers to parts of Anton columns 1-5 and 8. As explained more fully below, Anton does not disclose a graft copolymer having a hydrophilic backbone and a hydrophobic side chain as specified in the pending claims. The Anton graft copolymers are different. The attention of the Examiner is respectfully invited to Anton column 3, lines 17-33 and 48-59, and column 4, lines 12-16, where Anton discloses a polymeric backbone that is hydrophobic, and a side chain that is hydrophilic. In contrast to this Anton disclosure, the present invention has the side chain of the claimed graft copolymer as being hydrophobic,

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since the graft copolymer is composed of the monomer represented by formula (1) of pending claim 1. Anton fails to disclose or suggest the claimed side chain composed of the monomer of formula (1). Anton also fails to disclose or suggest the monomer content of the claimed graft copolymers. Anton fails to disclose or suggest the claimed invention.

ISSUES UNDER 35 USC 103

The rejection of claims 5-6 in paragraph 8 of the current Office Action as obvious over Ma in view of U.S. Patent 5,336,725 (Tone) is traversed, but has been rendered moot by the present amendments to both independent claims.

The rejection of claim 5-6 as obvious over Anton in view of Tone is traversed. Since Anton does not disclose the subject matter of either independent claim, it makes no difference how Tone is combined with Anton, since the resulting hypothetical combination does not meet the terms of the claims.

The rejection of claims 8-9 in paragraph 9 of the current Office Action as obvious over Ma or Anton, either in view of U.S. Patent 6,057,384 (Nguyen) or U.S. Patent 5,629,365 (Razavi) is traversed.

Since neither Ma nor Anton discloses subject matter within either independent claim, it makes no difference how the subject

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matter of the dependent claims is combined. The result is still not subject matter within the scope of any claim now presented.

The rejection of claim 8 in paragraph 10 of the last Office Action over Ma or Anton, either in view of U.S. Patent 5,977,207 (Yui) is traversed for similar reasons. Since neither Ma nor Anton disclose the subject matter within the scope of the claims, it makes no difference how Yui is combined with either Ma or Anton. The result of any such hypothetical combination still does not result in subject matter within the scope of that claimed.

The rejection of claim 15 in paragraph 11 of the last Office Action as obvious over Ma alone is traversed, but is rendered moot in view of the present amendments to the claims, which now specify a specific monomer content neither disclosed nor suggested by Ma.

The rejection of claims 19 and 20 in paragraph 12 of the last Office Action as obvious over either Ma or Anton is traversed. There is absolutely no disclosure in either Ma or Anton that would lead one skilled in the art to provide subject matter with the specific monomer content now specified in both independent claims.

The rejection of claims 1, 4 and 7 in paragraph 13 of the last Office Action as obvious over U.S. Patent 5,589,522 (Beach)

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in view of Ma is traversed. Neither Beach nor Ma show the monomer content now specified in both independent claims.

The rejection of claims 8-9 in paragraph 14 of the last Office Action as obvious over Beach in view of Ma and further in view of Nguyen or Razavi is traversed. None of these cited references contains the monomer content now specified in both independent claims. It makes no difference in what manner these references are combined, the result is still not subject matter within the scope of that claimed.

CONCLUSION

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact David R. Murphy (Reg. No. 22,751) at the telephone number of the undersigned below.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicants respectfully petition for a three (3) month extension of time for filing a reply in connection with the present application, and the required fee of $930.00 is attached hereto.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
John W. Bailey, #32,881

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Exhibits:

A. Version with Markings to Show Changes Made

B. "Polymer Nomenclature"; McGraw-Hill; September 1993 (selected pages)

C. "A brief Introduction to Polymer Science" (selected pages)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

The claims have been amended as follows:

Claim 1. (**Twice Amended**) A water-based ink comprising:

(A)   a coloring material; and

(B)   an aqueous dispersion of polymer particles comprising a

water-insoluble graft copolymer [having] comprising an

acrylic polymer side chain (P) and a salt-forming group

(Q), wherein the acrylic polymer side chain (P) is a

(co)polymer [made of at least one monomer] consisting

essentially of:

at least one monomer represented by the following formula

(1) [:],

$$CH_2=C(R^1)COOR^2 \qquad (1)$$
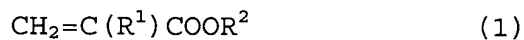
wherein R^1 is a hydrogen atom or an alkyl group

having 1 to 5 carbon atoms[;], and R^2 is an alkyl group having

1 to 20 carbon atoms; and optionally

at least one comonomer [which is a] selected from styrene

acrylonitrile and vinyl acetate, and

wherein the content of the monomer represented by the

formula (1) in the (co)polymer is not less than 60 % by

weight.

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Claim 11. (**Amended**) The water-based ink according to claim 1, wherein said acrylic polymer side chain (P) has a number average molecular weight of 300 to 20,000.

Claim 14. (**Amended**) The water-based ink according to claim 4, wherein said nonionic polymer side chain (R) has a number average molecular weight of 300 to 10,000.
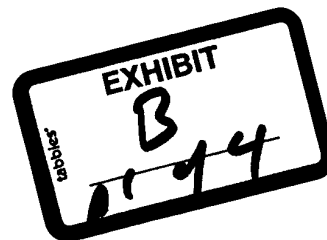
Claims 21-23 have been added.

高分子命名法

原著出版担当／W. V. メタノムスキー
（社）高分子学会高分子命名法委員会／訳
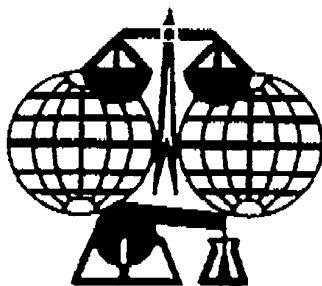
マグロウヒル

規則5.4　3種類以上のモノマーからつくられ，さらにブロック自身が統計連鎖配列を示すブロックコポリマーは規則2.1の原理に従って命名する．

(例)　統計連鎖配列

-A_k-block-B_m-block-C_n-block-B_m-block-A_k-block-C_n-

の名称は

ポリ (ポリ A-stat-ポリ B-stat-ポリ C)

である．

規則5.5　複数のブロックが，ブロックの一部でない接合単位 (junction units) X によって結合しているブロックコポリマーの名称では，接合単位の名称を適切な位置に挿入する．接続記号 -block- は省略してもよい．したがって，

A_k-block-X-block-C_m　　または　　A_k—X—C_m

の名称は，

ポリ A-block-X-block-ポリ C　　または　　ポリ A—X—ポリ C

である．同様の表現がブロックポリマーにも適用できる．

(例)　ポリスチレン-block-ジメチルシリレン-block-ポリブタジエン
　　　polystyrene-block-dimethylsilylene-block-polybutadiene

または

ポリスチレン—ジメチルシリレン—ポリブタジエン
polystyrene—dimethylsilylene—polybutadiene

ポリスチレン-block-ジメチルシリレン-block-ポリスチレン
polystyrene-block-dimethylsilylene-block-polystyrene

または

ポリスチレン—ジメチルシリレン—ポリスチレン
polystyrene—dimethylsilylene—polystyrene

規則5.6　ポリマー分子中で接合単位 X を通じて結ばれた A_k ブロックと B_m ブロックが

-A_k-block-X-block-B_m-block-X-block-B_m-block-X-block-A_k-

のように統計的に分布しているブロックコポリマーの名称は，

ポリ [(ポリ A-block-X)-stat-(ポリ B-block-X)]

である．A_k ブロックと B_m ブロックと接合単位 X が

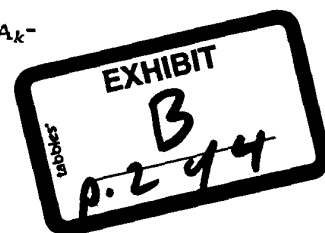-A_k-block-X-block-B_m-block-A_k-block-B_m-block-X-block-B_m-block-X-block-A_k-

のようにすべて統計的に分布しているブロックコポリマーの名称は．

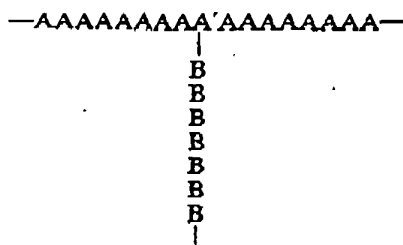ポリ (ポリ A-stat-X-stat-ポリ B)

である．

6.　グラフトコポリマー (Graft copolymers)

グラフトポリマーは，側鎖として主鎖に結合した1個または複数個のブロックがあり．しかもこ

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れらの側鎖が主鎖とは異なる構成上または配置上の特徴をもつ分子からなるポリマーである [5]. グラフトコポリマーでは，側鎖は構成上主鎖とは異なる特徴をもつ．すなわち，側鎖に含まれる単位の少なくとも1つは，主鎖の単位を与えるモノマーと異なる種類のモノマーから得られたものである.

規則6.1　グラフトコポリマーのもっとも簡単な場合は A_k-*graft*-B_m または

```
—AAAAAAAAAʹAAAAAAA—
           |
           B
           B
           B
           B
           B
           B
           |
```

で表され，相当する名称は，

ポリ A-*graft*-ポリ B

である. はじめに名称を示すモノマー（この場合 A）は幹（主鎖）の単位を与えるモノマーであり，次に名称を示すモノマー（B）は枝（側鎖）にあるものである.

（例）　以下の各例は，それぞれグラフト連鎖配列，相当する名称，および特定の例の順に示してある.

1. A_k-*graft*-B_m
   ポリ A-*graft*-ポリ B
   ポリブタジエン-*graft*-ポリスチレン
   polybutadiene-*graft*-polystyrene
   （ポリスチレンがグラフトしたポリブタジエン）

2. (A_k-*block*-B_m)-*graft*-C_n
   （ポリ A-*block*-ポリ B）-*graft*-ポリ C
   （ポリブタジエン-*block*-ポリスチレン）-*graft*-ポリアクリロニトリル
   (polybutadiene-*block*-polystyrene)-*graft*-polyacrylonitrile
   （ポリアクリロニトリルが無指定位置にグラフトしたポリブタジエン-ポリスチレンブロックコポリマー）

3. (A-*stat*-B)-*graft*-C_n
   ポリ (A-*stat*-B)-*graft*-ポリ C
   ポリ（ブタジエン-*stat*-スチレン）-*graft*-ポリアクリロニトリル
   poly(butadiene-*stat*-styrene)-*graft*-polyacrylonitrile
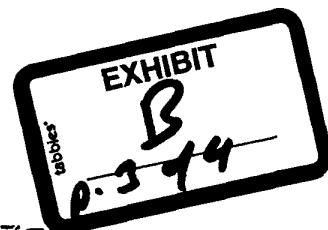   （ポリアクリロニトリルが無指定位置にグラフトしたブタジエン-スチレン統計コポリマー）

4. A_k-*block*-(B_m-*graft*-C_n)
   ポリ A-*block*-（ポリ B-*graft*-ポリ C）または（ポリ B-*graft*-ポリ C）-*block*-ポリ A
   ポリブタジエン-*block*-（ポリスチレン-*graft*-ポリアクリロニトリル）
   polybutadiene-*block*-(polystyrene-*graft*-polyacrylonitrile)
   または

155
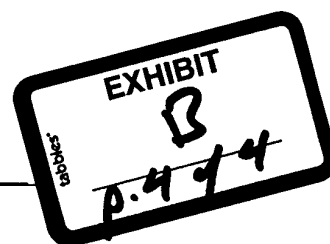
Source for Exhibit C

doc]Chapter 1-new
File Format: Microsoft Word 97 - View as HTML
... We need first to **define** a few concepts that are important for the further ... B);
alternating
copolymer: poly(A-alt-B); graft copolymer: poly(**A-graft-B**). The major ...
www.met.kth.se/student-info/ 0203/KOLT/Polymer-gedde.doc - Similar pages

1.1. Fundamental definitions

Polymers consist of large molecules, i.e. macromolecules. According to the basic IUPAC definition [Metanomski, 1991]:

'A polymer is a substance composed of molecules characterised by the multiple repetition of one or more species of atoms or groups of atoms (constitutional repeating units) linked to each other in amounts sufficient to provide a set of properties that do not vary markedly with the addition of one or a few of the constitutional repeating units'.

The word **polymer** originates from the Greek words 'poly' meaning many and 'mer' meaning part. It was the Swedish chemist Jöns Jacob Berzelius (1832) who suggested the term polymer for any compound with a molar mass that was a multiple of the molar mass of another compound with the same elemental composition. Figure 1.1 shows the structure of polypropylene, an industrially important polymer. The constitutional repeating units, which are also called simply "repeating units", are linked by covalent bonds, and the atoms of the repeating unit are also linked by covalent bonds. A molecule with only a few constitutional repeating units is called an **oligomer**. The physical properties of an oligomer vary with the addition or removal of one or a few constitutional repeating units to or from its molecules. A **monomer** is the substance that the polymer is made from, which in the case of polypropylene is propylene (propene) (Fig. 1.1). The process that converts a monomer to a polymer is called **polymerisation**.
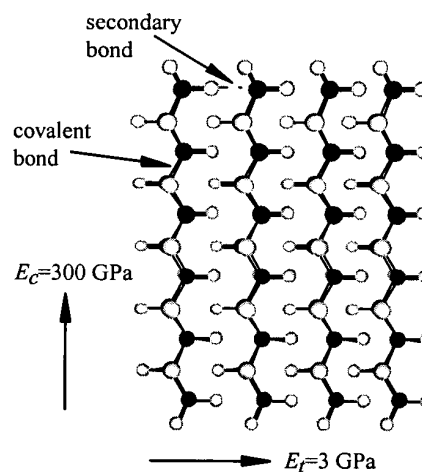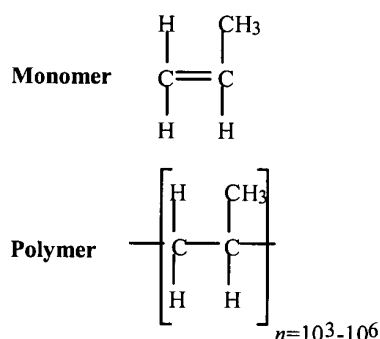

Figure 1.1. The structure of monomer and polymer (polypropylene). The constitutional repeating unit is shown between the brackets.

Figure 1.2. Anisotropic nature of polymer crystals Approximate moduli for polyethylene parallel (E_c and transverse (E_t) to the chain axis are shown.

The polymers dealt with in this book are exclusively carbon-based organic polymers. Other common elements in the organic polymers are hydrogen, oxygen, nitrogen, sulphur and silicon. The **covalent bonds** that link the atoms of the polymer chains are very strong with dissociation energies between 300 and 500 kJ mol^{-1}. The intermolecular bonds, sometimes denoted secondary bonds, are much weaker with dissociation energies of a few to 50 kJ mol^{-1}. To assess the stability of primary and secondary bonds, these energies may be compared with the thermal energy, i.e. RT, where R is the gas constant and T is the absolute temperature given in kelvin. The thermal energy is approximately 2.5 kJ mol^{-1} at 300 K and approximately 4 kJ mol^{-1} at 500 K.

1.5. Homopolymers and copolymers

A **homopolymer** consists of only one type of constitutional repeating unit (A). A **copolymer**, on the other hand, consists of two or more constitutional repeating units (A,B, etc). Several classes of copolymers are possible: **block** copolymers, **alternating** copolymers, **graft** copolymers and **statistical** copolymers (Fig. 1.19).

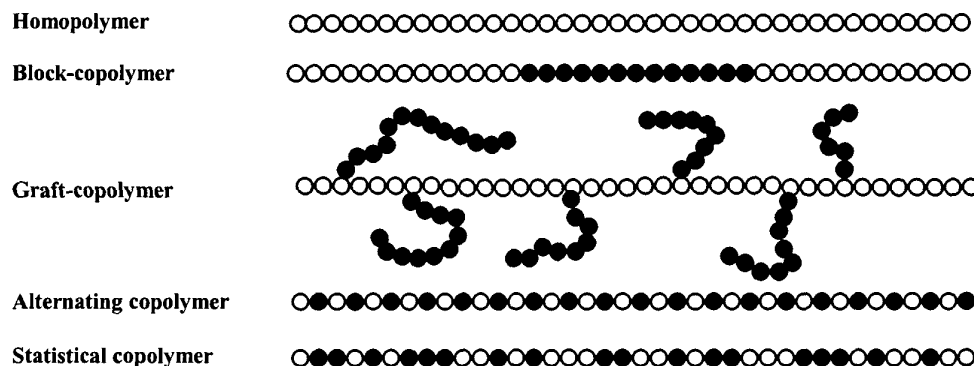|	
Homopolymer	OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
Block-copolymer	OOOOOOOOOOOOO●●●●●●●●●●●●●●●OOOOOOOOOOO
Graft-copolymer	OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
Alternating copolymer	O●O●O●O●O●O●O●O●O●O●O●O●O●O●O●O●O●O●O●O●
Statistical copolymer	O●●OO●O●●●OO●O●OOO●●OO●O●●OOO●●●O●OO●OO

Figure 1.19. Homopolymer and different classes of copolymers. Unit A: ; unit B:

The different copolymers with constitutional repeating units A and B are named according to the source-based nomenclature rules as follows: unspecified type: poly(A-*co*-B); statistical copolymer: poly(A-*stat*-B); alternating copolymer: poly(A-*alt*-B); graft copolymer: poly(A-*graft*-B). The major constituent (A) is given first. Note that the constitutional repeating unit of the backbone chain of the graft copolymer is specified first.

A **random** copolymer is a special type of statistical copolymer. The probability of finding a given constitutional repeating unit at any given site in a random copolymer is independent of the nature of the adjacent units at that position. A statistical copolymer may however obey known statistical laws, e.g. Markovian statistics. The term random copolymer is occasionally used for polymers with the additional restriction that the constitutional repeating units are present in equal amounts. The notation for a random copolymer is poly(A-*ran*-B). Copolymerisation provides a route for making polymers with special, desired property profiles. A statistical copolymer consisting of units A and B, for instance, has in most cases properties intermediate between those of the homopolymers (polyA and polyB). An important deviation from this simple rule arises if either polyA or polyB is semi-crystalline. The statistical copolymer (poly(A-stat-B)) is for most compositions fully amorphous. Block and graft copolymers form in most cases a two-phase morphology and the different phases exhibit properties similar to those of the respective homopolymers. **Di-block** (A-B) and **tri-block** (A-B-A) copolymers are often made by so-called living polymerisation (section 1.9). These polymers have found applications as thermoplastic elastomers and as compatibilisers to increase the adhesion between the phases in polymer blends. **Terpolymers** consist of three different repeating units: A, B and C.